# Analysis of displaced electron tracks with the silicon vertex tracker in Au+Au collisions $\sqrt{s_{NN}}$ = 200 GeV at RHIC-PHENIX†

H. Asano,[*1,*2] A. Adare,[*3] Y. Akiba,[*2] S. Bathe,[*4,*2] J. Bryslawskyj,[*4] T. Hachiya,[*2] T. Koblesky,[*3] M. Kurosawa,[*2] D. McGlinchey,[*3] T. Moon,[*5,*2] K. Nagamishima, [*6,*2] H. Nakagomi,[*7,*2] R. Nouicer,[*8] T. Rinn[*9] Z. Rowan,[*4] T. Sumita,[*2] A. Taketani,[*2] and the PHENIX VTX group

The PHENIX Collaboration at the Relativistic Heavy Ion Collider (RHIC) has measured open heavy flavor production in minimum bias Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV via the yields of electrons from semileptonic decays of charm and bottom hadrons. Previous heavy flavor electron measurements indicated substantial modification in the momentum distribution of the parent heavy quarks due to the quark-gluon plasma created in these collisions[1]. However, at that time, PHENIX was not able to distinguish electrons from charm and bottom hadrons independently.

For the specific purpose of separating the contributions of electrons from charm and bottom hadrons at midrapidity, the PHENIX Collaboration has added micro-vertexing capabilities in the form of a silicon vertex tracker (VTX) in 2011. The different lifetimes and kinematics for charm and bottom hadrons decaying to electrons enables separation of their contributions with measurements of displaced tracks (i.e. the decay electron not pointing back to the collision vertex).

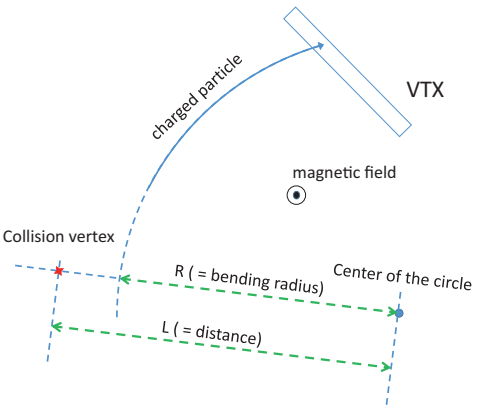


Fig. 1. Illustration of the definition of $\mathrm{DCA}_T \equiv L$ - $R$ in the transverse plane.

We measured the distance of closest approach of electron tracks in the transverse plane ($\mathrm{DCA}_T$) as illustrated in Fig.1 and subtracted various backgrounds: misidentified hadrons, mis-reconstructed electron, conversion electrons, electrons from Dalitz decay, kaon decay electrons, heavy-quarkonia decay.

After subtracting those backgrounds, we performed an unfolding procedure to fit the $\mathrm{DCA}_T$ distribution as shown in Fig.2. The sum of the background components, electrons from charm and bottom decays is shown as the red curve for direct comparison with the data. The gray band indicates the region in $\mathrm{DCA}_T$ considered in the unfolding procedure.

In conclusion, we have succeeded in separation of electrons from charm and bottom hadrons decay by using the VTX detector.

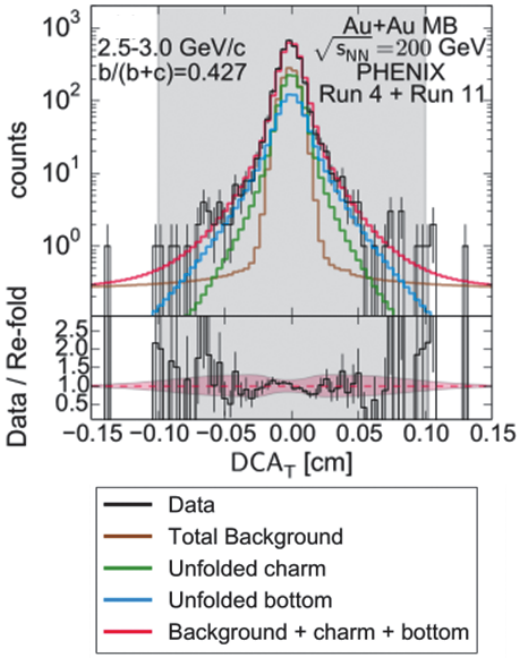


Fig. 2. The $\mathrm{DCA}_T$ distribution for measured electrons compared to the decomposed $\mathrm{DCA}_T$ distributions for background components, electrons from charm decays, and electrons from bottom decays.

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*1 Department of Physics, Kyoto University
*2 RIKEN Nishina Center
*3 Department of Physics, University of Colorado Boulder
*4 Department of Natural Science, City University of New York
*5 Department of Physics, Yonsei University
*6 Department of Physics, Hiroshima University
*7 Graduate School of Pure and Applied Sciences, University of Tsukuba
*8 Brookhaven National Laboratory
*9 Department of Physics and Astronomy, Iowa State University

## References

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